Pre Calculus **Name:**
Unit 2 Review #1 **Date:**

This sheet represents the types of questions and concepts you will find on the test. It is not, however, meant to be a replica of the test. Study all notes, homework assignments, quizzes, and this review to prepare adequately.

I Factor. Solve for 0 if necessary.

1. $-3x^2 + x + 12 = -4x^2 + 32$ $x^2 + x - 20 = 0$ $(x+5)(x-4) = 0$ $x = -5 \quad x = 4$

2. $4x^2 + 20x + 25$ $4x^2 + 10x + 10x + 25$ $2x(2x+5) + 5(2x+5)$ $= (2x+5)(2x+5)$

3. $6x^2 + 19x + 10 = 0$ $6x^2 + 4x + 15x + 10 = 0$ $2x(3x+2) + 5(3x+2) = 0$ $(2x+5)(3x+2) = 0$ $x = -\frac{5}{2} \quad x = -\frac{2}{3}$

4. $12x^2 + 7x + 8 = 2x^2 + 20$ $10x^2 + 7x - 12 = 0$ $10x^2 + 15x - 8x - 12 = 5x(2x+3) - 4(2x+3) = (5x-4)(2x+3)$ $= 0$ $x = \frac{4}{5} \quad x = \frac{-3}{2}$

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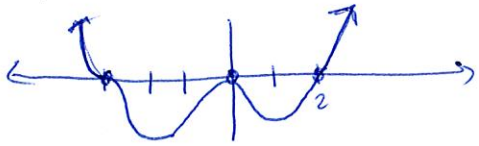
5. $20x^3 - 5x = 5x(x^2-1) = 5x(x+1)(x-1)$

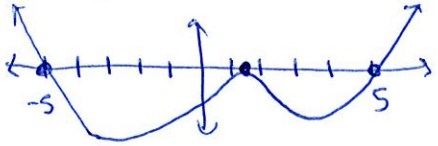
6. $(x+1)^2 - 4y^2$ $((x+1)+2y)((x+1)-2y)$

II Graphs

1. Find the real zeros and their multiplicities of $f(x) = x^2(x-2)(x+3)^3$. $x = 0$, mult 2; $x = 2$, mult 1; $x = -3$, mult 3
2. Sketch the graph of problem 1.



3. Find the real zeros and their multiplicities of $f(x) = (2x-3)^2(x^2+25)$. $x = \frac{3}{2}$, mult 2; $x = -5$ mult 1; $x = 5$ mult 1
4. Sketch the graph of problem 3. $(2x-3)^2(x+5)(x-5)$



5. Find the factored form of a 3rd degree polynomial with zeros of 2,-3, and 5.

$f(x) = (x-2)(x+3)(x-5)$

6. Run a full analysis (all asymptotes and intercepts), and sketch a graph of: $f(x) = \frac{2x-1}{x^2-16}$? $= (x+4)(x-4)$

x-int: $(\frac{1}{2}, 0)$ V.A. $x = 4$, $x = -4$

y-int: $(0, \frac{1}{16})$ H.A. $y = 0$

III Rational Expressions and Equations

Simplify the expressions. Leave the denominator!!!

1. $\dfrac{5x(x+3)}{x^2(x+3)} = \dfrac{5}{x}$

2. $\dfrac{18x^2y^5}{6x^6y^2}$ $\dfrac{3y^3}{x^4}$

only cancel FACTORS!

3. $\dfrac{2(x+1)}{(x-3)(x-1)} \cdot \dfrac{(x-3)(x+1)}{(x+1)}$

$\dfrac{2(x+1)}{(x-1)}$

4. $\dfrac{3x^6}{5y^5} \div \dfrac{8}{5x^5y^9}$

$\dfrac{3x^6}{5y^5} \cdot \dfrac{5x^5y^9}{8} = \dfrac{3x^{11}y^4}{8}$

5. $\dfrac{10}{4y+8} - \dfrac{3}{7y+14}$

$\dfrac{(7)}{7}\dfrac{10}{4(y+2)} - \dfrac{3}{7(y+2)}\left(\dfrac{4}{4}\right)$

$\dfrac{58}{28(y+2)}$

6. $\dfrac{3}{n+4} + \dfrac{4}{n^2-16}$

$(n+4)(n-4)$

$\dfrac{3(n-4)+4}{(n+4)(n-4)} = \dfrac{3n-12+4}{(n+4)(n-4)} = \dfrac{3n-8}{(n+4)(n-4)}$

More: Simplify the following rational expressions.

7. $\dfrac{(a-2)^2}{(a^2-5a+6)} \div \dfrac{(a-2)^2}{(a-3)}$ $\dfrac{1}{a-2}$

8. $\dfrac{\dfrac{x^2+7x}{3x}}{\dfrac{49-x^2}{3x-21}} = \dfrac{\dfrac{x(x+7)}{3x}}{\dfrac{(7+x)(7-x)}{3(x-7)}} = \dfrac{x-7}{7-x} = -1$

9. $\dfrac{\left(\dfrac{p}{p-4} - \dfrac{1}{4}\right)}{\left(\dfrac{9}{4p} + \dfrac{p^2}{p-4}\right)} = \dfrac{\dfrac{4p-1(p-4)}{4(p-4)}}{\dfrac{9(p-4)+4p^3}{4p(p-4)}} = \dfrac{p(3p+4)}{4p^3+9p-36}$

Solve the equations. Get a common denominator, then you can solve just the numerator.

Make sure to check for extraneous solutions.

10. $x+\frac{3}{x}=4$

$x^2+3=4x$ $\quad x^2-4x+3=0$

$x=1 \quad x=3$

11. $x+\frac{1}{x-4}=0$

$x(x-4)+1=0$

$x^2-4x+1=0$

My mistake. You need Quad Formula to solve - can't factor.

12. $\frac{2x}{x-1}+\frac{1}{x-3}=\frac{2}{x^2-4x+3}$

$(x-3)(x-1)$

$2x(x-3)+1(x-1)=2$

$2x^2-6x+x-1=2$

$2x^2-5x-3=0$

$(2x+1)(x-3)=0$

$x=-\frac{1}{2} \quad x=3$ Extraneous!

13. $\frac{x-3}{x}+\frac{3}{x+2}+\frac{6}{x^2+2x}=0$

$(x-3)(x+2)+3x+6=0$

$x^2+2x=0$

$x(x+2)=0$

$x=0 \quad x=-2$

Both extraneous! No solution

IV Rational Graphs

Find the asymptotes, holes, and intercepts for the following functions.

1. $f(x)=-\frac{3}{x-1}$

x-int: none
y-int: $(0,3)$
V.A. $x=1$
H.A. $y=0$
No holes

2. $g(x)=\frac{5-2x}{x+4}$

x-int: $(\frac{5}{2},0)$
y-int: $(0,\frac{5}{4})$
V.A. $x=-4$
H.A. same degree!
$y=\frac{-2}{1}=-2$
No holes

3. $h(x)=\frac{2x^2-2}{x^2-4}=\frac{2(x+1)(x-1)}{(x+2)(x-2)}$

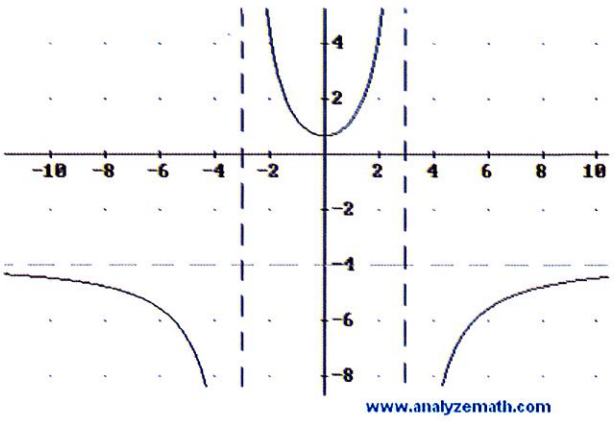
x-int: $(1,0)\ (-1,0)$
y-int: $(0,\frac{1}{2})$
No Holes
V.A. @ $x=-2 \quad x=2$
H.A. @ $y=\frac{2}{1}=2$

4. $i(x)=\frac{x^3}{x^2-9}$

$\frac{x^3}{(x+3)(x-3)}$ = x-int: $(0,0)$ y-int $(0,0)$
No Holes
V.A. $x=3 \quad x=-3$
H.A. None!
Deg. is bigger on top.

5. $j(x)=\frac{x^2-16}{x+4}$

For the rational function below



20. a. Find the vertical asymptote, the horizontal asymptote, and all intercepts.
~~b. Create a possible rational function to fit this graph.~~

(a) V.A. @ $x=3$, $x=-3$; H.A. $y=-4$; x-int: none! y-int: (0,1)

(b) $\dfrac{4(x^2+\quad)}{(x+3)(x-3)}$

Miscellaneous

23. Your friend tells you that the functions $f(x)=\dfrac{x^2-36}{2x+12}$ and $g(x)=\dfrac{1}{2}(x-6)$ are identical functions. Do you agree with him? If not, how are the functions different and why?

$f(x)=\dfrac{(x+6)(x-6)}{2(x+6)}$ Hole!

These graphs will look exactly the same, but there will be a hole at $x=-6$ for $f(x)$.